

Staging of Bronchogenic Carcinoma at Tertiary Health Care Centre with Multidetector Computed Tomography and Histopathological Correlation

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A B S T R A C T

Introduction: Bronchogenic carcinoma is most common cause of cancer-related mortality in the developed world with incidence rising in developing countries. MDCT is the modality of choice for evaluating the lung carcinomas. The objectives of our study were to assess the role of multi detector computed tomography in diagnosis, characterization and staging of lung cancer and their cytopathological correlation.

Material and Methods: Data was collected from 82 patients with clinically or radiologically suspected pulmonary mass lesion referred for CT scan of chest to Department of Radiodiagnosis GMC, Kota (Rajasthan). Collected data was analyzed based on the variables of the lung lesion seen on CT images followed by CT diagnosis and correlation made with histopathology report. Finally, only those patients with a cytopathologically confirmed diagnosis of lung cancer were included in the final analysis.

Results: The maximum prevalence of bronchogenic carcinoma was seen between 60–69 years of age (37.80%) with male predominance (82.93%). About 78.04% patients showed positive smoking history. Cough with expectoration (84.15%) was the most common symptom. The most common histological presentation was Adenocarcinoma in 38 patients (46.34%) followed by squamous cell carcinoma in 28 patients (34.14%). Most common tumor among the males was squamous cell carcinoma and among females was adenocarcinoma.

Conclusion: CT is a highly sensitive (96.34%) and highly specific (84.62%) test with high positive predictive value (97.53%) to diagnose Bronchogenic carcinoma in a sample suitably selected and referred for malignancy. MDCT is a useful tool in the staging of Bronchogenic Ca.

Keywords: Bronchogenic Carcinoma, Multi Detector Computed Tomography and CT/USG guided FNAC.

INTRODUCTION

A status report on the global burden of cancer worldwide using the GLOBOCAN 2018 estimates of cancer incidence and mortality produced by the International Agency for Research on Cancer, with a focus on geographic variability across 20 world regions. There will be an estimated 18.1 million new cancer cases (17.0 million excluding nonmelanoma skin cancer) and 9.6 million cancer deaths (9.5 million excluding nonmelanoma skin cancer) in 2018.

In both sexes combined, lung cancer is the most commonly diagnosed cancer (11.6% of the total cases) and the leading cause of cancer death (18.4% of the total cancer deaths), closely followed by female breast cancer (11.6%), prostate cancer (7.1%), and colorectal cancer (6.1%) for incidence and colorectal cancer (9.2%), stomach cancer (8.2%), and liver cancer (8.2%) for mortality.

Lung cancer is the most frequent cancer and the leading cause of cancer death among males, followed by prostate and colorectal cancer (for incidence) and liver and stomach cancer (for mortality). Among females, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death, followed by colorectal and lung cancer (for incidence), and vice versa (for mortality).

Burden of the disease in India

It is the second most common cancer in men and the fifth most common cancer in both men and women together.

MATERIAL AND METHODS

This prospective study was conducted from May 2017 to April 2019 (Two year). 53 patients with clinical or radiological suspicion of bronchogenic carcinoma referred for CT scan of thorax to the Department Of Radio Diagnosis, Government

Medical College Kota (Rajasthan) will be taken.

Inclusion criteria

Patients with clinically or radiologically suspected bronchogenic carcinoma.

Patients in whom histopathological correlation is available.

Exclusion criteria

Patients in whom histopathological correlation is not available.

Severely debilitated patient

Renal impairment

Allergic to contrast media

Previously diagnosed cases of bronchogenic carcinoma who were treated and now comes with recurrence.

Method of collection of data

Data will be collected from cases of suspected bronchogenic carcinoma referred for CT scan of thorax by purposive sampling using a proforma.

All scans are done using GE bright speed 16 slice MDCT with 120 KVp and 300 mAs with 5mm section thickness, retro reconstruction of 0.625mm section thickness and reformation. Contrast study is done using 70-80 ml of 350mg/ml non-ionic iodinated contrast, injected using pressure injector at the rate of 3-4ml/s. Lung lesions are characterised based on the site, size, enhancement pattern, presence of calcification, cavitation, involvement of the hila, pleura, chest wall or mediastinum MDCT findings are correlated with histopathological examination of the specimen obtained from FNAC / biopsy of the lesion.

Equipment

CT is performed with multi-slice CT scanner GE Bright Speed 16.

STATISTICAL ANALYSIS

Collected data were analysed based on the variables of the lung lesion seen in CT images as already mentioned followed by CT diagnosis and staging and correlation made with histopathology report. As the study design is diagnostic test evaluation, collected data were analysed by calculating sensitivity, specificity, positive predictive value, negative predictive.

RESULTS

This study was conducted in the Department of Radiodiagnosis, Government Medical College Kota (Rajasthan) from May 2017 to April 2019. The study comprised of a total of 82 patients.

Among the 82 patients included in this study, 17.07% were females (n = 14) and 82.93% were males (n=68). Hence we can conclude that bronchogenic carcinoma has got a more male preponderance over females.

The age distribution of patients with Bronchogenic carcinoma in our study was between the age group of 40-89 years with a mean age of 65 years. 37.80% of the patients were in the age group of 60-69 years (n = 31), 31.71% were in the age group of 59 - 59 years (n =26). Thus we have observed that Bronchogenic carcinoma is more common in the age group of 60-69 years and secondly in age group of 50-59 years.

In our study involving eighty two patients, 84.15% of patients

had cough with expectoration (n = 69), 58.54% patients had weight loss (n = 48), 62.20% patients had anorexia (n = 51), 52.44% patients had chest pain (n = 43), 39.02% patients had dyspnea (n = 32) and 23.17% patients had hemoptysis (n = 19). Therefore from our study it was evident that cough followed by anorexia and weight loss were the most common symptoms of patients with bronchogenic carcinoma.

In our study 52.44% lesions were peripheral in location (n = 43) and 47.56% of lesions were central in location (n= 39).

In our study of eighty two patients with bronchogenic carcinoma distant metastasis of Bronchogenic carcinoma were seen in 26 patients (31.70%). Liver is most common site of metastasis with 13 patients (15.85%) followed by bone in 9 patients (10.97%), adrenal in 8 patients (09.76%) and peritoneum in 2 patient (02.44%) respectively.

In our study of eighty two patients with bronchogenic carcinoma, it revealed that the 82.93% of patients had mediastinal lymph nodes (n=68), 62.20% had subcarinal lymph nodes (n =51), 54.88% had hilar lymph nodes (n=45) and 03.66% had supraclavicular lymph nodes (n=3). Hence mediastinal lymphadenopathy is the most common type of lymph node involvement in patients with bronchogenic carcinoma.

In our study of eighty two patients with bronchogenic carcinoma the distribution of various histological types of bronchogenic carcinoma is as follows; 46.34% of patients had adenocarcinoma (n = 38), 34.14% patients had squamous cell carcinoma (n = 28), 11.04% patients had small cell carcinoma (n = 11), 06.10% patients had undifferentiated large cell carcinoma (n = 5). Thus in our study it indicates that adenocarcinoma is most common type of Bronchogenic carcinoma.

74.39% of patients in our study were diagnosed with T4 stage of the tumor at the time of presentation. 19.51% had T3 stage tumor at the time of presentation, 03.66% had T2b stage of tumor, 02.44% had T2a stage of tumor and no patient recorded in T1a, T1b and T1c stages of tumor.

57.31% of patients in our study were in N2 stage at the time of diagnosis, 26.83% were in N3 stage, 10.97% were in N0 stage and 04.88% was in N1 stage.

36.58% of patients in our study were in M1a stage with tumor in contralateral lung or pleural/ pericardial nodule/ malignant effusion, 32.93% were in M0 stage with no evidence of metastases, 19.51% were in M1c stage with evidence of multiple extra-thoracic metastases and 10.98% were in M1b stage with single extrathoracic metastasis intrapulmonary/ pleural metastasis or malignant pleural / pericardial effusion.

Accuracy of MDCT in evaluation of bronchogenic carcinoma

Comparison of CT diagnosis with Histopathological diagnosis of bronchogenic carcinoma

These (table-1,2) validity tests shows CT is a highly sensitive (96.34%) and highly specific (84.62%) test and also has a high positive predictive value (97.53%) to diagnose Bronchogenic carcinoma.

Multi Detector Computed Tomography has a high positive predictive value suggestive of great diagnostic accuracy in the

		Histo-pathological diagnosis for Bronchogenic carcinoma		
		Yes	No	Total
CT diagnosis for Bronchogenic Carcinoma	Yes	79 (True positive)	02 (False positive)	81
	No	03 (False negative)	11 (True negative)	14
Total		82	13	95

Table-1(A): Sensitivity, Specificity, Positive predictive value, Negative predictive value and accuracy of CT to diagnose Bronchogenic carcinoma

Validity Test	Percent
Sensitivity	96.34%
Specificity	84.62%
Positive predictive value	97.53%
Negative predictive value	78.57%
Accuracy	94.74%

Table-1(B): Validity Tests Value

evaluation of Bronchogenic Carcinoma.

Comparison between adenocarcinoma and squamous cell carcinoma

50.94% of male patients had adenocarcinoma (n=25) and 49.06% of male patients had squamous cell carcinoma (n = 26). 84.62% of female patients had adenocarcinoma (n = 13) and 15.38% of the female patients had squamous cell carcinoma (n = 02).

Chi squared equals 4.846 with 1 degrees of freedom. The one-tailed P value equals 0.0139 is considered to be statistically significant.

Hence from our study it is evident that adenocarcinoma is more commonly seen in female patients and squamous cell carcinoma is more commonly seen in male patients.

46.88% of patients with central lesions had adenocarcinoma (n=15) and the remaining 53.12% had squamous cell carcinoma (n=17). 67.65% of patients with peripheral lesions had adenocarcinoma (n =23) and 32.35% had squamous cell carcinoma (n=11). Chi squared equals 2.912 with 1 degrees of freedom. The one-tailed P value equals 0.0440 is considered to be statistically significant.

Hence from our study it is evident that adenocarcinoma is more commonly seen in peripheral location and squamous cell carcinoma is more commonly seen in central location.

Out of the non-smokers, 86.67% had adenocarcinoma (n =13) and 13.33% had squamous cell carcinoma (n = 01). Chi squared equals 6.726 with 1 degrees of freedom. The one-tailed P value equals 0.0048 is considered to be very statistically significant.

Thus it can be concluded that adenocarcinoma commonly affects non-smokers and squamous cell carcinoma is more commonly seen in smokers

DISCUSSION

In present study of 82 patients, the study group is divided into five age groups (decades) 40 to 49 years, 50 to 59 years, 60 to 69 years, 70 to 79 years and 80-89 years. It was observed that maximum 31 (37.80%) patients were in the 60 to 69

years age group while age group 50 to 59 years constituting 26 (31.71%) patients and 70 to 79 years constituting 13 (15.85%) of patients. This is concordance with study by Saket RK et al¹ (2016) and Hathila N et al² (2016) this study is contrary to study done by Narayanswamy I et al³ (2015) Yadav D et al⁴ (2016) and Dr. Babu S et al⁵ (2016).

Male to female ratio is 4.85:1 in our study which is similar to the study of Malik PS et al⁶ (2013), Saket RK et al¹ (2016), Shah D et al⁷ (2017) and Biswas P et al⁸ (2016).

Bronchogenic carcinoma is seen more commonly in smokers (78.05%) than non-smokers (21.95%). Similar observations have been reported by Shetty CM et al⁹ (2005), Rawat J et al¹⁰ (2009), Saket RK et al¹ (2016), Yadav D et al⁴ (2016) and Parvaiz AK et al¹¹ (2010).

In our study there is evidence of a strong association between the occurrence of smoking and squamous cell carcinoma. Similar results were obtained in study by Krishnamurthy A et al¹² (2012) and Arora VK et al¹³ (1990).

Our study showed that adenocarcinoma is commonly seen in non- smokers. This is in agreement with the study by Dey A et al¹⁴ (2012), Behera D et al¹⁵ (2004), Shetty CM et al⁹ (2005) and Krishnamurthy A et al¹² (2012).

Cough is the most common presenting complaint among patients in our study (84.15%) followed by loss of appetite (62.20), loss of weight (58.54%) and chest pain (52.44%). This is concordance with study by Saket RK et al¹ (2016), Yadav D et al⁴ (2016), Hathila N et al² (2016), Quamrul M et al¹⁶ (2010).

Tumour characteristics

In our study it was found that the lesions were slightly more peripherally located (52.44%) and the rest were found in a central location (47.56%). This is in concordance with the study done by Vigg A et al¹⁷ (2003), Dr Adaikkalavan C et al¹⁸ (2017), Biswas P et al⁸ (2016) and Narayanswami I et al³ (2015) where peripheral lesions are found to be more common than central lesions.

62.20% of cases in our study have a spiculated contour which is concordance to the study by Shetty CM et al⁹ (2005), Dr. Adaikkalavan C et al¹⁸ (2017), Yadav D et al⁴ (2016) and Biswas P et al⁸ (2016).

All 100% cases showed heterogeneous contrast enhancement. This is concordance with the study by Dr Adaikkalavan C et al¹⁸ (2017), Hathila N et al² (2016) and Shah D et al⁷ (2017).

301.70% of patients in our study had distant (extrathoracic) metastasis at the time of presentation. This is in concordance with the study by Saket RK et al¹ (2016).

In our study the most common site for metastasis was seen to be liver (15.85%) followed by bone (10.97%). This is concordance with study by Shah D et al⁷ (2017), Dr. Modi M et al¹⁹ (2016) and Sawhney M et al²⁰ (2017).

Mediastinal lymph node involvement was seen in 82.93% of cases with bronchogenic carcinoma in our study. Similar findings were seen in studies by Yadav D et al⁴ (2016).

In the present study, majority of patients were diagnosed at latter stage of disease. The majority of Bronchogenic carcinoma patients had advanced stage disease (IIIB and IV). Similar observation reported by Prasad R et al²¹ (2009), Malik PS et al⁶ (2013), and Shah D et al⁷ (2017).

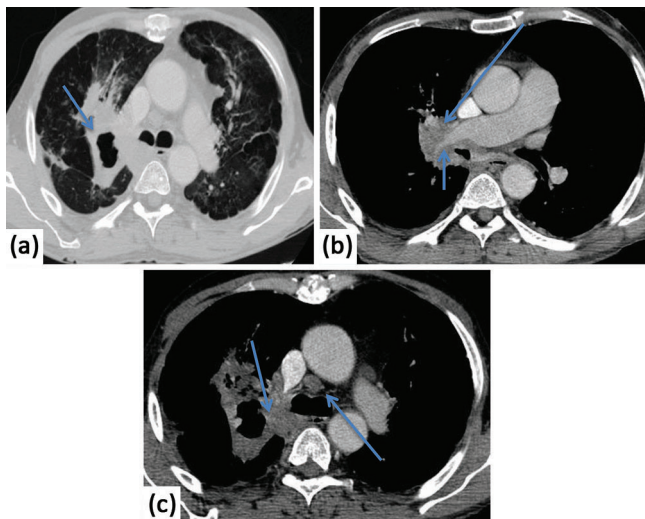


Figure-1: (a). CECT chest axial view in lung window showing cavitary mass lesion in right lung with mediastinal infiltration; (b). CECT chest axial view showing narrowing of right main bronchus and right pulmonary artery invasion; (c). CECT chest axial plane showing metastatic lymphnode in pre tracheal region, On HPE, mass was diagnosed as squamous cell carcinoma.

Histopathology

In our study adenocarcinoma was seen to be the most common histological subtype accounting for 46.34% of cases. This is in concordance with the study by Malik PS et al⁶ (2013), Krishnamurthy A et al¹² (2012), Shad D et al⁷ (2017), Dr. Modi M et al¹⁹ (2016) and Dr. Babu S et al⁵ (2016) which showed an increasing trend in the incidence of adenocarcinoma.

However, our findings are contrary to the studies done by Dr. Adaikkalavan et al¹⁸ (2017), Rawat J et al¹⁰ (2009), Saket RK et al¹ (2016) and Yadav D et al⁴ (2016) which revealed that squamous cell carcinoma was the most common histological subtype followed by adenocarcinoma.

CONCLUSION

CT is a highly sensitive and highly specific test and also has a high positive predictive value to diagnose Bronchogenic carcinoma. Multi Detector Computed Tomography has a high positive predictive value suggestive of great diagnostic accuracy in the evaluation of Bronchogenic Carcinoma. There is significant correlation with the MDCT diagnosis of Bronchogenic carcinoma with that of histopathology. Computed tomography is the most sensitive and non-invasive imaging modality that provides valuable information of the tumor characteristics and its extent. MDCT is a useful tool in the staging of Bronchogenic Carcinoma.

Case-1

58 years old male came with cough with expectoration, dyspnea and hemoptysis since 8 months.

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